High-Speed Neutron and Gamma Flux Sensor for Monitoring Surface Nuclear Reactors, Phase I

Completed Technology Project (2010 - 2010)

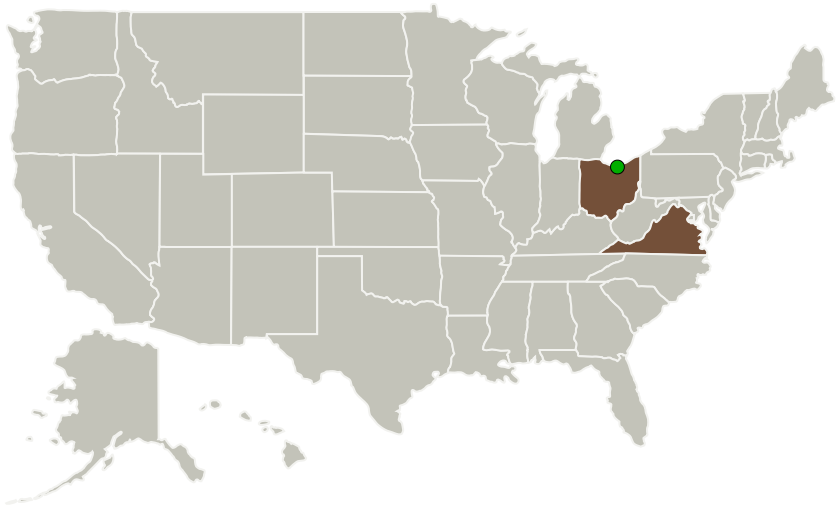
Project Introduction

NASA needs compact nuclear reactors to power future bases on the moon and Mars. These reactors require robust automatic control systems using low mass, rapid response, in-core reactor power monitoring sensors and radiation tolerant sensor interrogation systems that do not yet exist. Luna proposes to develop a new type of fiber optic miniature neutron flux and gamma flux sensor, which will have significantly faster response than recently developed fiber optic radiation sensors. The new sensors will maintain the advantages of current fiber optic reactor sensor technology, including small size for in-core sensor distributions, high temperature performance (above 600

o

C), and immunity to electrical noise in the presence of ionizing radiation. During Phase I, Luna will demonstrate the feasibility of high-speed fiber optic gamma flux sensors in a nuclear reactor. Phase II will optimize the sensor design and the interrogation system for high temperature in-core monitoring of both gamma flux and neutron flux with internal thermal compensation and in-situ thermal calibration. At the end of Phase II, Luna will deliver a lightweight sensor interrogation system, utilizing experimentally verified radiation hardened components wherever possible, and including an analog output signal for interfacing with standard reactor control electronics.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140113)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Luna Innovations, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

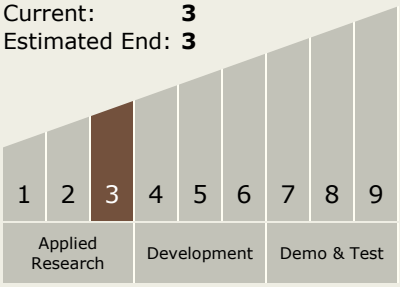
Carlos Torrez

Principal Investigator:

Clark Boyd

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.1 Management and Control

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System